

# Fisher® RSS Lined Globe Valve

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Figure 1. Fisher RSS Valve with 667 Actuator and FIELDVUE™ DVC6200 Digital Valve Controller



## Introduction

### Scope of Manual

This instruction manual includes installation, maintenance, and parts information for NPS 1 through NPS 4 Fisher RSS lined globe valves. Refer to separate manuals for instructions covering the actuator, positioner, and accessories.

### Description

The RSS lined globe-style valve (figure 1) has pure-modified PTFE trim parts, push-down-to- close action, and positive shutoff. This valve is intended for applications involving severely corrosive and toxic flowing media, and is well-suited for pure media applications, as well. The RSS valve body provides an economical alternative to alloy valve bodies in a wide variety of applications.

Do not install, operate, or maintain an RSS valve without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance. **To avoid personal injury or property damage, it is important to carefully read, understand, and follow all the contents of this manual, including all safety cautions and warnings.** If you have any questions about these instructions, contact your Emerson Process Management sales office before proceeding.



**Table 1. Specifications****Valve Sizes**

NPS ■ 1, ■ 1-1/2, ■ 2, ■ 3, and ■ 4

**Face-To-Face and Flange Compatibility**

VALVE SIZE, NPS	DUCTILE IRON			
	Raised-Face Flange			
	CL150		CL300	
	Face-To-Face		ASME <sup>(1)</sup>	EN <sup>(2)</sup>
ASME <sup>(1)</sup>	EN <sup>(2)</sup>	ASME <sup>(1)</sup>	EN <sup>(2)</sup>	
1	X	X	X	---
1-1/2	X	X	X	---
2	X	X	X	---
3	X	X	---	---
4	X	X	---	---

1. For ANSI/ISA face-to-face dimensions, see figure 9.

2. For EN face-to-face dimensions, see figure 9.

**Maximum Inlet Pressures and Temperatures<sup>(1)</sup>**

See table 2

**Downstream/Outlet Pressure Ratings<sup>(1)</sup>**

See figures 3 and 4

**Shutoff Classification**

Class VI per ANSI/FCI 70-2 and IEC 60534-4

**Application Limits****Liquid Service:** For cavitating applications, contact your Emerson Process Management sales office**Gas Service:** Velocity  $\leq$  0.33 MACH**Temperature Capabilities****Positive Pressure Service:** -29 to 180°C (-20 to 360°F)**Vacuum Service:** -29 to 180°C (-20 to 360°F)**Standard Flow Characteristic/Valve Plug Style**

Equal percentage

**Flow Direction**

Up through the seat ring (see figure 7)

**Packing Arrangement**

Braided PTFE rings

**Dimensions and Weights**

See figure 9

1. The pressure or temperature limits in this manual, and any applicable standard limitations should not be exceeded.

**Table 2. Maximum Allowable Inlet Pressures and Temperatures<sup>(1)</sup>**

TEMPERATURE, °C	PRESSURE, BAR		TEMPERATURE, °F	PRESSURE, PSIG	
	Ductile Iron			Ductile Iron	
-29 to 38	19.7		-20 to 100	285	
93	17.9		200	260	
149	15.9		300	230	
180	14.8		360	215	

1. Includes valves with CL300 flanges.

## Educational Services

For information on available courses for Fisher RSS valves, as well as a variety of other products, contact:

Emerson Process Management  
 Educational Services - Registration  
 Phone: 1-641-754-3771 or 1-800-338-8158  
 E-mail: [education@emerson.com](mailto:education@emerson.com)  
<http://www.emersonprocess.com/education>

## Specifications

Specifications for the RSS valve are shown in table 1. If the valve is shipped with the actuator, some of the valve specifications are on the valve nameplate, which is attached to the actuator. If the valve is shipped without the actuator, the valve nameplate is wired to the valve.

## Installation

### **⚠ WARNING**

Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.

Personal injury or equipment damage caused by sudden release of pressure can result if the valve is installed where service conditions could exceed the limits given on the nameplate or in table 1 or 2, or figure 3 or 4. To avoid such injury or damage, use pressure-limiting or pressure-relieving devices to prevent service conditions from exceeding these limits.

Check with your process or safety engineer for any other hazards that may be present from exposure to process media.

If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

### **CAUTION**

When ordered, the valve configuration and construction materials are selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions. Since some valve body/trim material combinations are limited in their pressure drop and temperature ranges, do not apply any other conditions to the valve without first contacting your Emerson Process Management sales office.

### **CAUTION**

Before installing the valve, inspect it to be certain that the valve cavity is free of foreign material. Use extra care in handling to avoid damage to the exposed lining on the flanges. Clean out all pipelines to remove scale, welding slag, and any other foreign materials that could cause erosion of the valve body lining.

Use accepted piping practices when installing the valve in the pipeline. To minimize valve damage caused by expansion of PTFE lined pipe, use a line flange gasket (figure 2). This gasket evenly distributes the piping loads across the valve flange face and minimizes the potential for cutting or indenting the lined face on the valve flange.

1. The control valve assembly should be installed in a horizontal pipeline with the valve stem in a vertical position. Before installing in any other orientation, consult your Emerson Process Management sales office.

Flow through the valve must be in the direction indicated by the arrow cast on the valve (figure 7).

2. With a leak-off bonnet construction, remove the pipe plug (key 20, not shown) and install the leak-off piping into the tapping in the bonnet (key 2, figure 10).
3. If continuous operation is required during inspection or maintenance, install a three-way bypass around the control valve assembly.
4. For a valve used with a fail-closed actuator, remove the shim (key 24, not shown) from between the bonnet and the travel stop. Discard the shim.
5. If the actuator and valve are shipped separately, refer to the appropriate actuator instruction manual for the actuator mounting procedure.

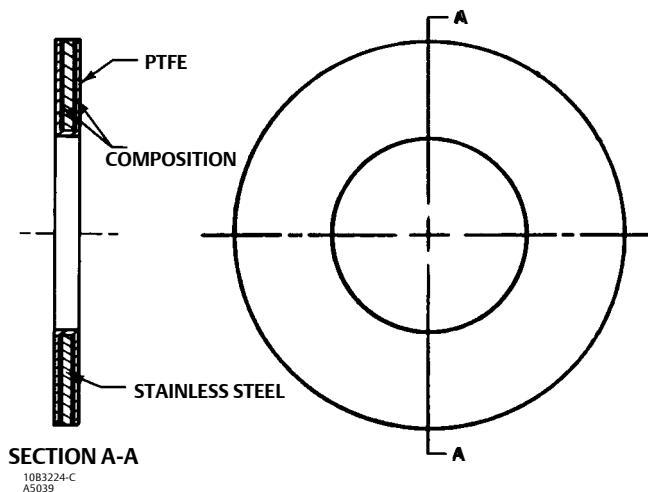
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#### Note

Bench sets for Fisher 657 and 667 actuators must be adjusted after installation on the RSS valve. The heavy duty bellows on the RSS valve has a significant spring rate that must be included in the bench set for proper operation.

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**Figure 2. Typical Line Flange Gasket (Key 17)**



## Maintenance

Valve parts are subject to normal wear and must be inspected and replaced as necessary. Inspection and maintenance frequency depends on the severity of service conditions. This section includes instructions for packing and trim replacement. All these maintenance operations may be performed with the valve in the line.

### **WARNING**

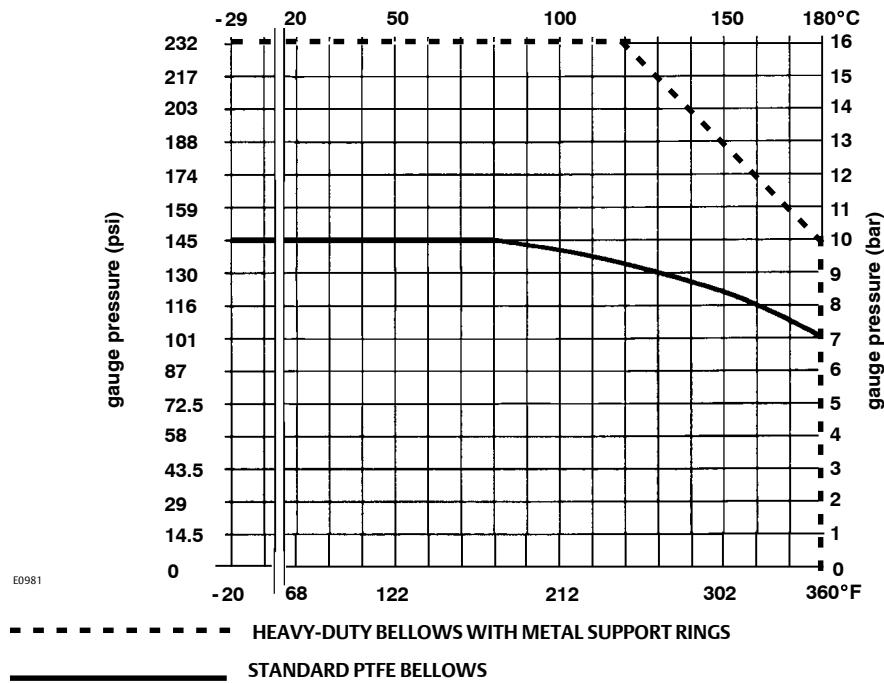
**Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance operations:**

- **Do not remove the actuator from the valve while the valve is still pressurized.**
- **Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.**
- **Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.**
- **Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.**
- **Vent the power actuator loading pressure and relieve any actuator spring precompression.**
- **Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.**
- **The valve packing box may contain process fluids that are pressurized, even when the valve has been removed from the pipeline. Process fluids may spray out under pressure when removing the packing hardware or packing rings, or when loosening the packing box pipe plug.**
- **Check with your process or safety engineer for any other hazards that may be present from exposure to process media.**

### **Note**

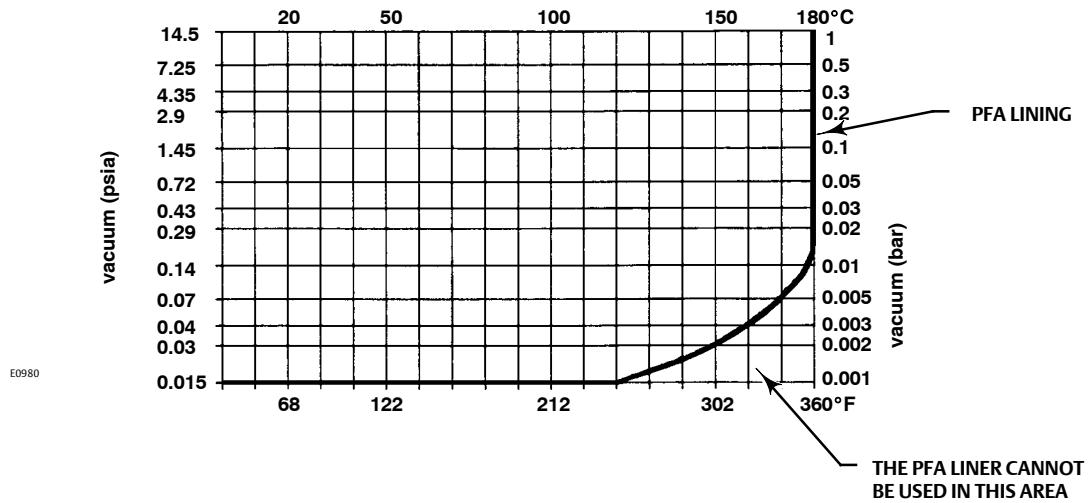
Whenever a line flange gasket (figure 2) seal is disturbed by removing the valve from the line, install a new gasket on reassembly. This is necessary to ensure a good gasket seal.

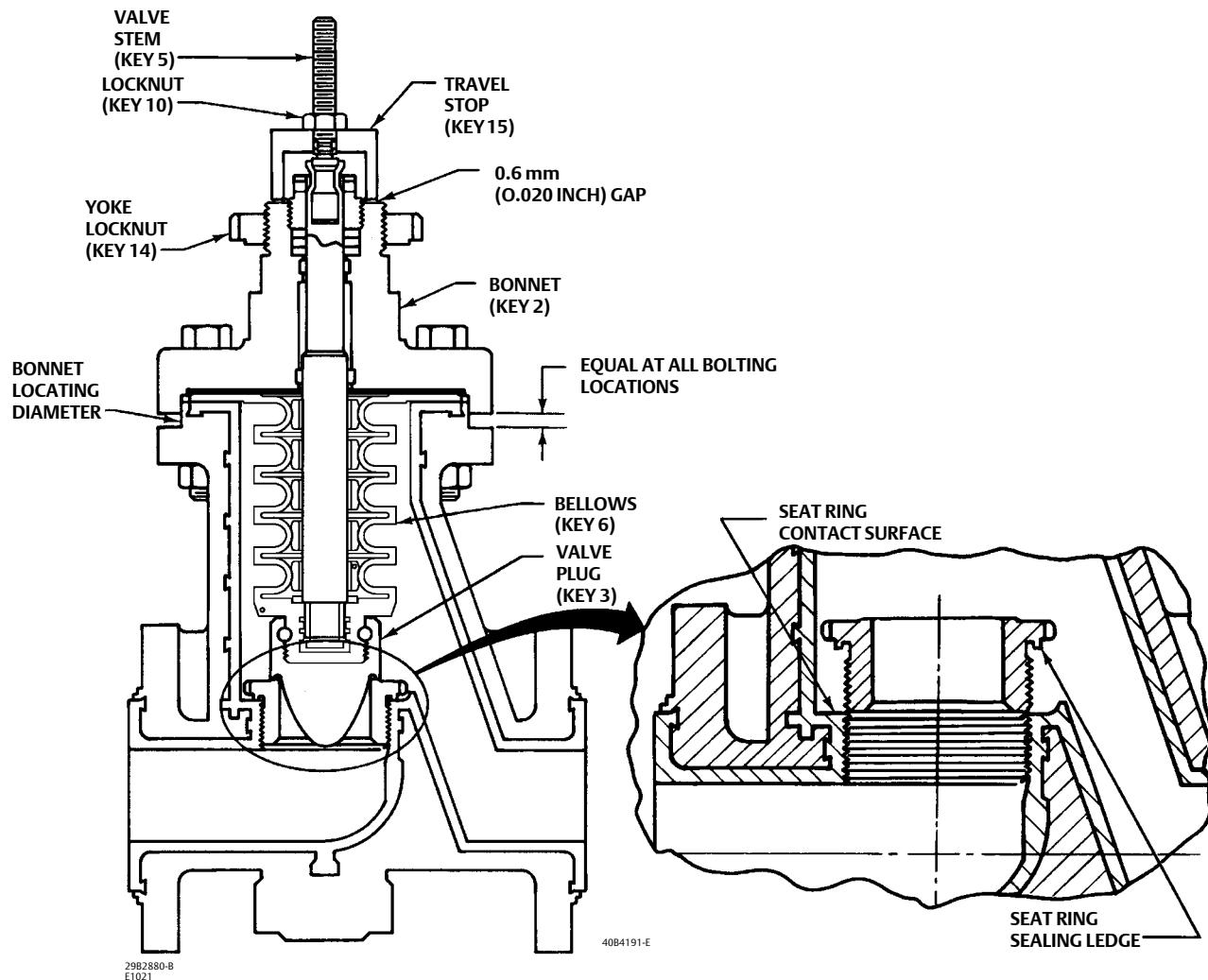
Figure 3. Downstream/Outlet Pressure Ratings (Positive Pressure Service)



NOTE: THE LINER DOES NOT LIMIT THE DOWNSTREAM PRESSURE RATING IN POSITIVE PRESSURE SERVICES.

Figure 4. Downstream/Outlet Pressure Ratings (Vacuum Service)



**Figure 5. Bonnet, Travel Stop, and Seat Ring Installation Detail**

## Packing Maintenance

Key numbers are shown in figure 10.

The packing consists of braided packing rings (key 13). The packing box is only a safety measure in case of a leak through the bellows (key 6). Therefore, the packing follower (key 11) is tightened to 1.13 N•m (10 lbf•in) of torque and then loosened one half turn. To detect a leak through the bellows (key 6), the bonnet (key 2) can be provided with a connection for leak-off piping.

## Replacing Packing and Bushing Inserts

Key numbers are shown in figure 10.

1. Isolate the control valve from the line pressure. Release pressure from both sides of the valve and drain the process media from both sides of the valve.
2. Exhaust all actuator pressure, and disconnect the operating lines from the actuator and any leak-off piping from the bonnet (key 2). Disconnect the actuator stem connector, and then remove the actuator from the valve by unscrewing the yoke locknut (key 14).
3. Remove any travel indicator parts, the locknut (key 10), and the travel stop (key 16) from the valve stem (key 5) threads.

### CAUTION

**Follow the procedures as described in the next steps to prevent damage to the bonnet sealing surface and to prevent packing box leakage.**

4. Remove the packing follower (key 11). Unscrew the cap screws (key 7) and hex nuts (key 8) that secure the bonnet (key 2) to the valve (key 1). Then, carefully lift the bonnet off and set it on a protective surface to prevent damage to the bonnet sealing surface. If the valve stem, bellows, and valve plug (keys 5, 6, and 3) come out with the bonnet, remove these parts from the bonnet.
5. Remove bushing inserts, packing rings, and packing box ring (keys 13, 12, 28, and 29).
6. Clean the packing box, packing box ring, and packing follower.
7. Inspect the valve stem and packing box surfaces for any sharp edges that might cut the packing. Scratches or burrs could damage new packing or cause packing box leakage. If the surface condition cannot be improved by light sanding, replace the damaged parts.
8. Install bushing inserts (keys 28 and 29).
9. Install the bonnet (key 2) over the valve stem (key 5). Slide the bonnet down until it properly engages the bonnet locating diameter (figure 5) of the valve.

### Note

In order to ensure accurate positioning of the valve plug (key 3) and seat ring (key 4), clearance between the valve and bonnet at all bolting locations (figure 5) must be equal and approximately 2.0 mm (0.080 inches) for NPS 1 through 4 valves. Be sure to measure the clearance in the next step.

10. Tighten the cap screws and hex nuts (keys 7 and 8) in a crisscross pattern to a maximum torque value of 50 N•m (37 lbf•ft). To ensure accurate positioning of the valve plug (key 3) into the seat ring (key 4), check the gap between

the valve and bonnet with a feeler gauge (figure 5). At all bolting locations, the gap must be equal and approximately 2.0 mm (0.080 inches) for NPS 1 through 4 valves. In order to keep the gap equal, the individual bolts may have to be tightened to different torque levels.

**Note**

Due to the cold flowing tendency of the valve liner, this procedure should be repeated upon installation and after the first thermal cycle of the valve.

11. Install the packing rings, packing box ring, and packing follower (keys 13, 12, and 11) over the valve stem. Tighten the packing follower to 1.13 N•m (10 lbf•in) of torque to ensure the packing rings are seated. After the packing rings are seated, loosen the packing follower one half turn.
12. Manually press the valve stem (key 5) into the valve until the valve plug contacts the seat ring.

**CAUTION**

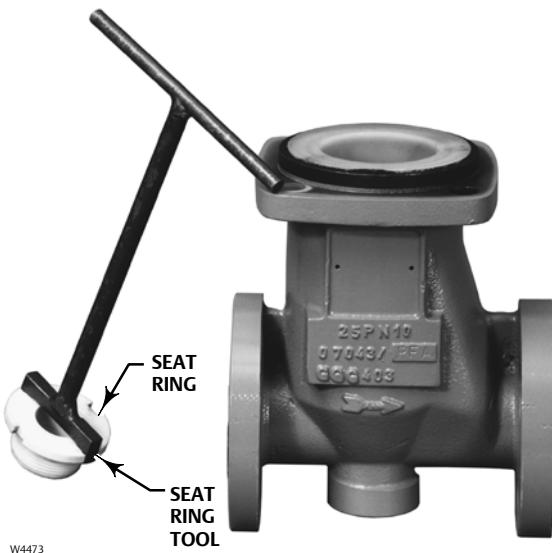
**Improper adjustment in step 13 might cause damage to trim parts. Perform this step carefully.**

13. Thread the travel stop (key 16) onto the valve stem until there is a 0.5 mm (0.020 inch) gap between the bottom surface of the travel stop legs and the top of the bonnet (figure 5).
14. Thread the locknut (key 10) onto the stem and tighten it against the travel stop.
15. Mount the actuator and secure it with the yoke locknut (key 14). Connect the actuator stem and valve stem according to the procedure in the appropriate actuator instruction manual.

**Figure 6. Typical Locking Rope Installation**



Figure 7. Fisher RSS Valve Body Shown with Tool Used to Remove or Install Seat Ring

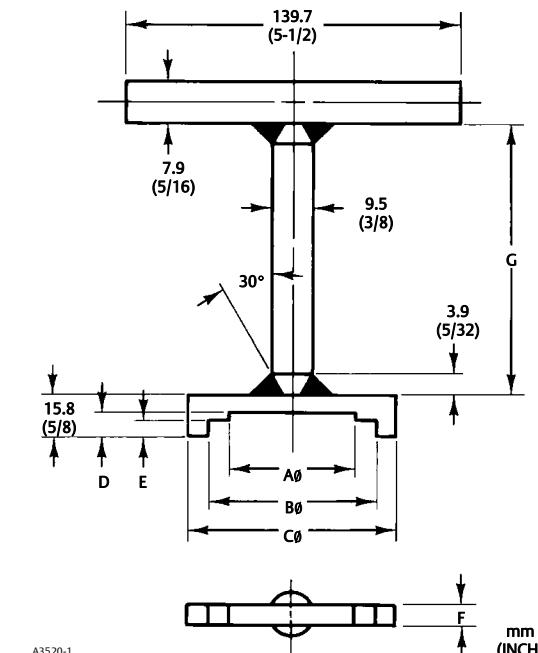


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Table 3. Seat Ring Tool Dimensions

VALVE SIZE, NPS	DIMENSIONS (MILLIMETERS)						
	A $\varnothing$	B $\varnothing$	C $\varnothing$	D	E	F	G
1	36.9 37.2	47.2 47.5	54.8 55.6	6.4	4.8	7.9 7.6	190
1-1/2	54.0 54.2	63.9 64.1	71.8 72.6	7.1	5.6	7.9 7.6	222
2	65.1 65.3	76.2 76.5	83.7 84.5	7.1	5.6	7.9 7.6	222
3	91.3 91.5	103.7 104.2	111.9 112.7	7.1	5.6	7.9 7.6	300
4	105.9 106.2	118.2 118.5	126.2 127.0	7.1	5.6	7.9 7.6	300
VALVE SIZE, NPS	DIMENSIONS (INCHES)						
	A $\varnothing$	B $\varnothing$	C $\varnothing$	D	E	F	G
1	1.45 1.46	1.86 1.87	2.16 2.19	1/4	3/16	0.31 0.30	7-1/2
1-1/2	2.13 2.14	2.52 2.53	2.83 2.86	9/32	7/32	0.31 0.30	8-3/4
2	2.56 2.57	3.00 3.01	3.30 3.33	9/32	7/32	0.31 0.30	8-3/4
3	3.59 3.60	4.09 4.10	4.41 4.44	9/32	7/32	0.31 0.30	11-7/ 8
4	4.17 4.18	4.66 4.67	4.97 5.00	9/32	7/32	0.31 0.30	11-7/ 8

Figure 8. Seat Ring Tool



**Table 4. Recommended Seat Ring Torque**

Valve Size, NPS	Newton Meters	Pound-Force Inches	Pound-Force Feet
1	8	71	---
1-1/2	23	---	17
2	30	---	22
3	50	---	37
4	50	---	37

## Trim Maintenance

Key numbers are shown in figure 10.

### Disassembly

1. Remove the actuator and the bonnet as described in steps 1 through 4 of the Replacing Packing and Bushing Inserts section.
2. Inspect parts for wear or damage that would prevent proper operation of the valve.
3. To replace the bellows (key 6), unscrew the valve stem (key 5) in a counterclockwise rotation. Install the valve stem into the new bellows with a clockwise rotation by hand. Do not overtighten.
4. To remove the valve plug (key 3), use pliers to remove the locking rope (key 9) that locks the valve plug to the bellows (key 6) as shown in figure 6. Then unscrew the plug from the bellows.

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#### Note

To avoid cold flow of the valve liner and deforming of the valve body seat ring threads and seat ring contact surfaces, promptly install a replacement seat ring according to step 1 of the Assembly procedures.

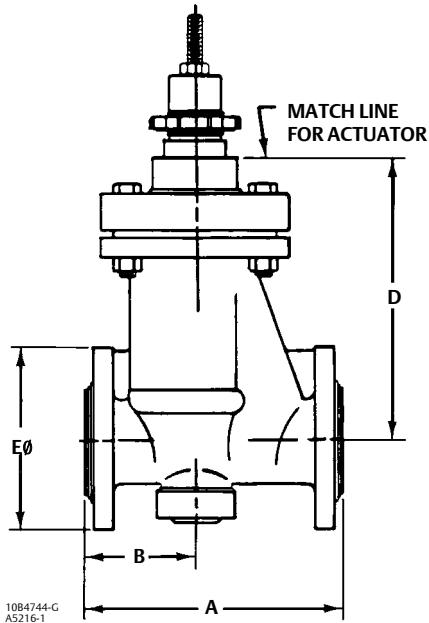
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5. To remove the seat ring (key 4), use the seat ring tool (figure 7 or 8) that can be ordered from the Parts List section or made according to the dimensions in figure 8 and table 3. To avoid cold flow of the valve liner and deforming of the valve body seat ring threads and seat ring contact surfaces, promptly install a replacement seat ring according to step 1 of the Assembly procedures.

Figure 9. Dimensions and Weights

ANSI/ISA CL150 FACE-TO-FACE DIMENSIONS MATING WITH CL150 FLANGES					
Valve Size	Dimensions				Approximate Weight
	A	B	D	E $\emptyset$	
NPS		mm			kg
1	184.0	83.0	185.0	108.0	10
1-1/2	222.0	97.0	225.0	127.0	17
2	254.0	107.0	230.0	152.4	20
3	298.0	121.0	340.0	190.5	39
4	350.0	176.0	350.0	220.0	42
NPS		Inches			Pounds
1	7.25	3.27	7.28	4.25	23
1-1/2	8.75	3.82	8.86	5.00	36
2	10.00	4.21	9.06	6.00	43
3	11.75	4.76	13.39	7.50	86
4	13.78	6.94	13.78	8.66	92

ANSI/ISA CL300 FACE-TO-FACE DIMENSIONS MATING WITH CL300 FLANGES					
Valve Size	Dimensions				Approximate Weight
	A	B	D	E $\emptyset$	
NPS		mm			kg
1	197.0	90.0	185.0	123.8	11
1-1/2	235.0	101.0	225.0	156.0	18
2	267.0	115.0	230.0	165.0	20
NPS		Inches			Pounds
1	7.75	3.54	7.28	4.87	25
1-1/2	9.25	3.97	8.86	6.14	40
2	10.50	4.53	9.06	6.50	45



## Assembly

### CAUTION

To avoid damage to the seat ring sealing surface and/or threads in the valve body liner, make or order the seat ring tool shown in figures 7 and 8. Installing the seat ring using other tools might cause permanent damage to the seat ring sealing surface and/or threads allowing excessive leakage of the valve.

1. Install the seat ring (key 4) with the seat ring tool (figure 7 or 8) that can be ordered from the Parts List or made according to the dimensions in table 3 and figure 8. Tighten the seat ring until contact is felt between the sealing ledge of the seat ring and its mating surface in the valve (figure 5). At this point, tighten the seat ring one quarter turn or to the torque values listed in table 4.
2. To install the valve plug (key 3), screw the valve plug onto the bellows and insert the locking rope with pliers (figure 6).
3. Install the assembled valve plug, bellows, and valve stem (keys 3, 6, and 5). For metal bellows, install the gasket (key 27).
4. Install the bonnet according to steps 9 and 10 of the Replacing Packing and Bushing Inserts procedure.

5. Tighten the packing follower (key 11) to 1.13 N•m (10 lbf•in) of torque to ensure the packing rings are seated. After the packing rings are seated loosen the packing follower one half turn.
6. Perform steps 12 through 15 of the Replacing Packing and Bushing Inserts section.

## Parts Ordering

Each valve body-bonnet assembly is assigned a serial number, which can be found on the valve nameplate. Refer to this serial number when contacting your Emerson Process Management sales office for technical assistance. If the valve is shipped with the actuator, the valve nameplate is attached to the actuator. If the valve is shipped without the actuator, the valve nameplate is wired to the valve. When ordering replacement parts, refer to this serial number and to the part number from the following Parts List.

### ⚠ WARNING

**Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher valve, because they may void your warranty, might adversely affect the performance of the valve, and could cause personal injury and property damage.**

## Parts List

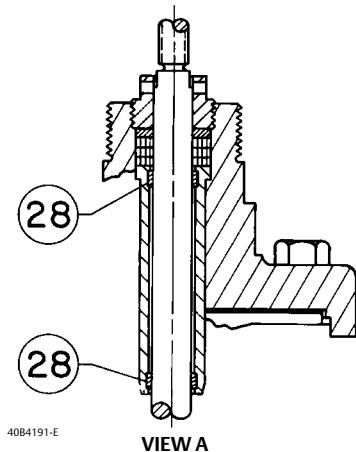
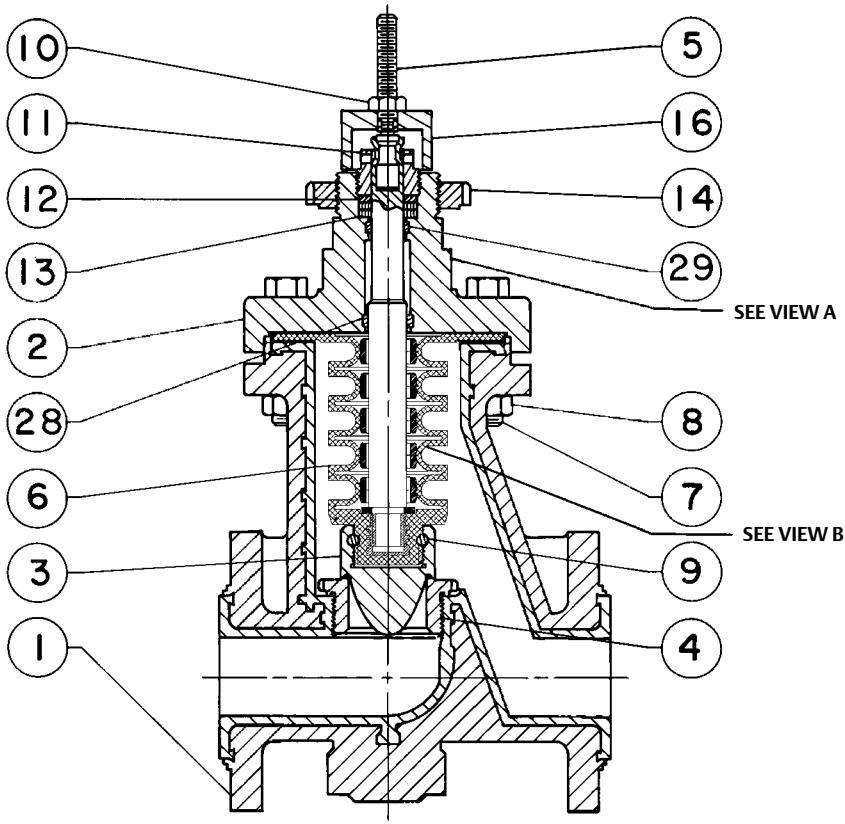
### Note

Part numbers are shown for recommended spares only. For part numbers not shown, contact your Emerson Process Management sales office. Except where indicated, sizes shown are valve body sizes.

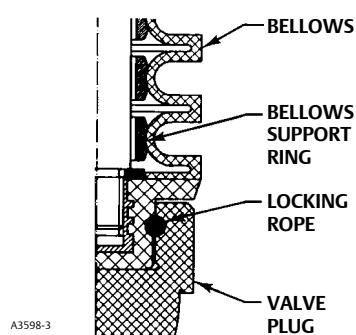
Key	Description	Part Number
1	Valve Body or valve body/ring assembly If you need a valve body or valve body/ring assembly as a replacement part, order by valve size, serial number, and desired material.	
2	Bonnet/Bushing Assembly If you need a bonnet/bushing assembly as a replacement part, order by valve size and stem diameter, serial number, and desired material.	
3*	Valve Plug	See following table
4*	Seat Ring	See following table
5*	Valve Stem Stainless steel NPS 1 NPS 1-1/2 & 2 NPS 3 & 4	21B7543X012 21B7544X012 20B2511X012
6*	Bellows	See following table
7	Cap Screw	
7	Stud	
8	Hex Nut	
9*	Locking Rope, PTFE NPS 1, 1-1/2, & 2 NPS 3 & 4	20B2519X022 20B2519X032

Key	Description	Part Number
10	Locknut	
11	Packing Follower	
12*	Packing Box Ring Stainless steel NPS 1, 1-1/2, 2, 3, & 4	20B2495X012
13*	Packing Ring, PTFE NPS 1, 1-1/2, & 2 (2 req'd) NPS 3 & 4 (3 req'd)	20B2504X012 20B2504X012
14	Yoke Locknut	
16	Travel Stop	
17*	Line Flange Gasket (for use only if specified, see figure 2), PTFE/composition/stainless steel (2 req'd) For CL150 NPS 1 NPS 1-1/2 NPS 2 NPS 3 NPS 4	10B3223X022 10B3224X022 10B3225X022 10B3226X022 10B3227X022
	For CL300 NPS 1 NPS 1-1/2 NPS 2	11B5886X022 11B5887X022 11B5888X022
18	Line Flange Cap Screws (for NPS 2 use only)	
20	Pipe Plug (for use w/tapped bonnet only--not shown)	
21	Seat Ring Tool (for use only if specified--see figure 7 or 8)	
22	Nameplate Seal & Wire (not shown)	
24*	Shim (for use only w/fail-to-close actuator during shipping [not shown]), aluminum	10B4192X012
25	Identification Plate, (not shown)	
26	Drive Screw	
28*	Bushing Insert, Carbon-filled PTFE NPS 1, 1-1/2, & 2 NPS 3 & 4 (2 req'd)	21B9345X042 21B9345X032
29*	Bushing Insert, Carbon-filled PTFE NPS 1, 1-1/2, & 2	21B9345X022

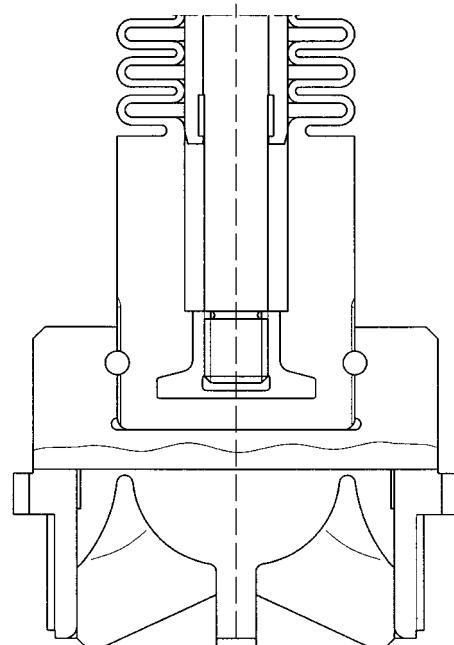
Figure 10. Fisher RSS Valve Assembly



DETAIL OF BONNET  
FOR NPS 3 AND 4 VALVES



DETAIL OF HEAVY DUTY  
PTFE BELLows CONSTRUCTION



DETAIL OF NPS 3 AND 4 U-PLUG

**Key 3\* Valve Plug for 8 through 96 mm (0.3125 through 4-inch) Port Diameters (Includes Locking Rope, Key 9)**

VALVE SIZE, NPS	PORT DIAMETER <sup>(1)</sup>		PART NUMBER
	mm	Inches	
1	8	0.3125	23B9209X022 <sup>(2)</sup>
	15	0.5	23B9208X022 <sup>(2)</sup>
	20	0.75	23B9207X022 <sup>(2)</sup>
	25	1	23B9206X022 <sup>(2)</sup>
1-1/2	25	1	21B9632X062
	40	1.5	21B9631X062
2	30	1.1875	21B9634X062
	50	2	21B9633X062
3	50	2	22B0701X062
	80	3.1875	22B0434X062
4	65	2.5	22B0702X062
	96	4	21B5680X062

1. Inch equivalents of these metric port diameters have been rounded to common fractional diameters. Actual diameter of the 15 millimeter port is 0.591 inches, of the 40 millimeter port is 1.575 inches, and of the 96 millimeter port is 3.780 inches.  
2. NPS 1 valve with 15 mm (0.591 inch) travel.

**Key 4\* Seat Ring**

VALVE SIZE, NPS	PORT DIAMETER <sup>(1)</sup>		PART NUMBER
	mm	Inches	
1	8	0.3125	20B4169X032
	15	0.5	20B4170X042
	20	0.75	20B4172X042
	25	1	20B2509X032
1-1/2	25	1	20B4174X032
	40	1.5	20B2508X032
2	30	1.1875	20B4164X032
	50	2	20B2507X032
3	50	2	20B4159X032
	80	3.1875	20B2506X032
4	65	2.5	20B4157X032
	96	4	20B2505X032

1. Inch equivalents of these metric port diameters have been rounded to common fractional diameters. Actual diameter of the 15 millimeter port is 0.591 inches, of the 40 millimeter port is 1.575 inches, and of the 96 millimeter port is 3.780 inches.

**Key 6\* Bellows**

VALVE SIZE, NPS	PORT DIAMETER	PART NUMBER
1	All	29B2879X022
1-1/2 and 2	All	29B2880X022
3 and 4	All	29B2881X022

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